Supporting Information

A pH-sensitive, stimuli responsive, superabsorbent, smart hydrogel from Psyllium (*Plantago ovata*) for intelligent drug delivery

Materials and methods

Temperature dependent swelling of PSH

For the determination of temperature dependent equilibrium swelling of PSH in DW at different temperatures, i.e., 25, 50, 60 and 70 °C for 12 h, PSH (0.1 g) was enclosed in each of the four tea-bags and placed in four beakers containing 100 mL DW each previously maintained at above mentioned temperatures. Swelling capacity of PSH was determined using eqn (6). Each experiment was repeated thrice and mean value was reported.

Results and discussion

Temperature dependent equilibrium swelling of PSH

Amongst the stimuli-responsive hydrogels, the temperature responsive hydrogels are one of the current research interests for their applications in drugs delivery.[1] In some pathological conditions, the body temperature may change which imparts its effect on the release of drugs from such drug delivery systems.[2,3] Keeping in view the importance of temperature for drug delivery systems, the equilibrium swelling capacity of PSH was evaluated in DW at different temperatures, i.e., 25, 50, 60 and 70 °C. Results revealed that swelling of PSH is temperature dependent and increased with the increase in temperature (Fig. S1). This might be because of the fact that by increasing temperature, segmental movement of the hydrogel chains also increased. Hence, water sorption capacity of polymer increased. The maximum and minimum equilibrium swelling of PSH was observed at 70 °C and 25 °C, respectively.

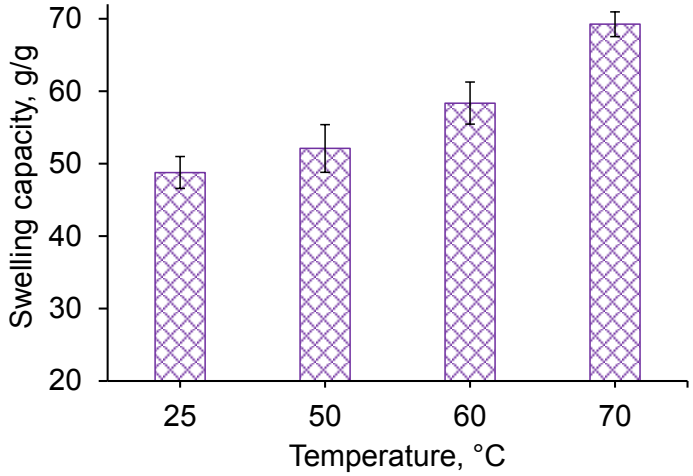

Fig. S1 Equilibrium swelling capacity of PSH powder in DW at different temperatures.

Sub-acute toxicity studies

Table S1 Body weight, and food and water intake of rats from treated and untreated groups

Parameters	Group I	Group II	Group III	Group IV
Body weight (g)				
Pretreatment	218.21±5.68	201.17±4.57	233.41±7.71	245.15±6.78
Day 1	218.09±6.11	200.79±5.53	232.52±4.47	245.74±5.45
Day2	219.15±5.29	199.40±6.45	232.37±6.18	244.81±4.21
Day3	219.57±4.06	199.37±7.52	231.46±5.51	243.08±6.39
Day5	223.42±5.83	200.07±4.66	229.91±3.81	241.82±3.64
Day 7	230.78±6.29	198.86±3.11	227.33±4.12	238.81±7.43
Day 14	245.42±7.76	196.56±6.91	224.15±5.35	235.36±6.71

Day 21	261.48±5.31	194.31±7.17	222.19±4.83*	230.67±5.49*
Day 28	276.89±7.02	192.14±4.92	220.48±5.22*	224.37±6.18*
Water intake (mL)				
Pretreatment	8.04±1.16	8.09±1.85	8.18±1.63	8.52±1.72
Day 1	8.50±1.31	8.13±2.90	8.87±1.58	8.13±2.21
Day 2	8.34±1.19	7.95±2.28	8.78±1.13	8.76±1.19
Day 3	9.05±1.81	7.54±1.60	8.56±2.23	7.89±2.20
Day 7	9.57±2.26	7.25±1.53	8.18±2.06	7.70±1.18
Day 14	9.93±1.22	7.47±1.96	7.82±1.16	7.16±2.03
Day 21	10.15±1.75	7.28±1.15	7.64±1.39	6.58±1.32
Day 28	10.41±1.66	7.19±2.42	7.31±1.13	6.27±2.01
Food intake (g)				
Pretreatment	6.19±1.58	5.84±1.31	6.41±1.53	6.67±2.35
Day 1	6.29±0.86	5.58±1.05	6.21±1.27	6.45±1.37
Day 2	6.50±1.76	5.42±1.32	6.11±1.80	6.27±0.71
Day 3	6.71±1.29	5.32±1.45	6.05±1.64	6.09±1.92
Day 7	7.85±1.64	5.01±.83	5.96±1.44	5.85±2.33
Day 14	8.71±2.37	4.94±1.68	5.67±1.18	5.44±.87
Day 21	9.48±2.10	4.77±1.81	5.26±1.23	4.68±1.55

Day 28	10.45±2.53	4.67±1.11	4.70±2.48*	4.06±1.31*

Values expressed as mean ± SEM

* $p < 0.05$ compared with control group

Table S2 Absolute organ weight (g) of rats

Organs	Group I	Group II	Group III	Group IV
Heart	0.285±0.01	0.273±0.01	0.296±0.01	0.303±0.01
Kidney	0.647±0.02	0.629±0.04	0.677±0.01	0.716±0.01
Stomach	1.661±0.02	1.646±0.03	1.772±0.02	2.024±0.05
Intestine	5.968±0.04	6.075±0.03	6.109±0.15	6.149±0.06
Liver	3.619±0.06	3.587±0.10	3.740±0.11	3.840±0.07

Values expressed as mean ± SEM

References

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3 P. Patel, A. Mandal, V. Gote, D. Pal and A. K. Mitra, *J. Polym. Res*. 2019, **26**, 131.